# REMARKS

## Introduction

Applicants thank the examiner for his detailed analysis of the application and allowance claims 1-4 and 6-28. Please note that a minor amendment was made to the preamble of claim 1 to remove superfluous language.

## Specification

The examiner objects to the previous specification amendment due to mis-labeling of the application as a "continuation." In reply, applicants submit herewith the appropriate replacement section of page 1 referring to the application as a "continuation-in-part."

## Claim Objection

The attached set of substitute claims corrects the spelling of "signals" in claim 14, as required by the examiner.

## Claim Rejection Under 35 U.S.C. §112, First Paragraph

The examiner contends that claims 7-10 lack the support in the specification required under 35 U.S.C. §112, 1st paragraph, and has requested applicants to show support for claim 7. In reply, applicants amend claim 7 of the attached set of substitute claims to recite an amplifier that amplifies the filtered low-level ultra wideband signal. This is shown in Fig. 8.

## Claim Rejection Under 35 U.S.C. §112, Second Paragraph

Claims 2-3 and 14-20 stand rejected under the second paragraph of §112. The examiner questions how the filter of claims 2 and 3 would operate with an impulse oscillator. In reply, Fig. 1 shows bandpass filter 110 that filters the oscillator output subsequent to exciting the impulse oscillator 106. Operation is explained at p. 20, lines 10-14 of the specification. Once the oscillator produces a UWB pulse, the bandpass filter may alter the upper and/or lower frequency emissions thereof. In the case of the UWB impulse generator

system, Fig. 2 shows a bandpass filter 102 that filters the output of impulse generator 100, which is further explained at p. 21, lines 26-28. A more detailed explanation is also provided below in connection with applicants' reply to the prior art rejection under §102(e).

Regarding the rejection relating to the recited "waveform adapter" of claims 2-3 and 23, correction has been made in the substitute claims.

Applicants have also resolved the antecedent basis question regarding the term "echo" in claim 25 by changing the definite article "the" to the indefinite article "an."

Accordingly, applicants believe all issues under the second paragraph of §112 are resolved and request withdrawal of the rejection.

**Claim Rejection under 35 U.S.C. §102(e)**

The examiner contends that claims 2 and 3 are anticipated under 35 U.S.C. §102(e) because McEwan '600 teaches a system or method that (i) generates a switched impulse low-level UWB signal using one of an impulse oscillator or an impulse generator, (ii) filters the low-level UWB signal, (iii) radiates the UWB signal, and (iv) receives an echo of the radiated signal. Because claim 1 (which recites a switched impulse generator and a filter to define a center frequency) was allowed, applicants observe claims 2 and 3 stand rejected seemingly because the switched impulse generator includes an *impulse oscillator*, which McEwan '600 purportedly discloses. In view of allowance of claim 1, it is not clear what element(s) of claims 2-3 are or art not shown by McEwan. Nevertheless, it appears that the examiner, in his paragraph 11, bases his rejection on an expansive definition of the term "filter" or "filtering," asserting that these terms embrace "devices and methods that limit, alter, or control the frequency or frequency range of the emitted UWB signal." Using this expanded definition, the examiner contends that McEwan's gated oscillator 10 and FM oscillator 17 amount to a filter because they "limit, alter, or control" the frequency or frequency range of the burst width modulator signal 13.

In paragraph 6, the examiner questions the operation of the filter or filtering recited in claims in the situation where the device includes an impulse oscillator, i.e., the examiner seems to be querying how or why there is need for a filter to limit, alter, or control frequency (or how does the filter operate) when the UWB signal to be filter was generated, *ab initio*, at a particular frequency by an impulse oscillator.

In reply, the term filter or filtering recited in claims 2 and 3 does not read on the structure or method disclosed by elements 10, 17 of McEwan '600. McEwan '600 is modulating the RF oscillator with a square wave (at approximately 10 kHz). This results in a two-frequency output -- a low frequency output when the square wave is at its lowest point and a high frequency output when the square wave is at its maximum. This is *not* equivalent to filtering a UWB pulse as meant by applicants' claims at issue since, among other things, no realizable causal filter can be made having that kind of response.

When using an impulse-driven oscillator, use of a filter or filtering would still be required to control emissions (spurious or otherwise) because frequency-modulated waveforms are not spectrally limited. Such waveforms have a frequency response which depends upon certain Bessel functions (see, for example, Philip Panter, "Modulation and Spectral Analysis", McGraw-Hill, 1965, Chapter 7, page 249) which extend over ALL frequencies. This is true regardless of the modulation rate. This is the reason FM stations have an ADDITIONAL filter before radiating emissions from the antenna; i.e., to avoid splatter into adjacent bands. Also, the amplitudes of these Bessel functions are NOT constant over any given frequency interval, and are a strong function of the modulating frequency and rate. Thus, the resulting spectral density of emissions produced by the system of McEwan '600 is not readily controllable or suppressed, and its shape changes with modulation, unlike a system or method of claim 2 or 3, which teaches a manner in which the spectral emissions can be precisely and repeatedly controlled.

Should applicants' comments fail to convince the examiner of the claims' distinctiveness over McEwan '600, request is made for a telephonic or personal interview prior to any further possible rejection or to discuss acceptable distinctive language relative to the filter or filtering limitation of applicants' claims.

**Claim Rejection under 35 U.S.C. §103**

Claims 14 and 21 stand rejected under 35 U.S.C. §103(a) as being unpatentable over McEwan '600 in view of disclosure of a tunnel diode by Ross et al. '054 and Nicolson et al. '422. Because claim 14 depends from claim 2 and claim 21 depends from claim 3, applicants traverse the asserted rejection for reasons stated above.

**Conclusion**

It appears that the primary obstacle to allowance turns on a definition of the term "filter." It is applicants' position that no realizable causal filter can be made having the kind of response shown by square-wave driven oscillator of McEwan '600 and that the claims at issue should be interpreted to exclude the kind of frequency control provided by McEwan '600. Should the examiner find this position unacceptable to overcome the applied art, we kindly request a face-to-face or telephonic interview to resolve the language that might be used to clarify the invention in a way to define over McEwan '600.

Favorable reconsideration is respectfully requested.

Respectfully submitted,
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**SPECIFICATION AMENDMENTS**
**(New Replacement Section)**

## CROSS-REFERENCE TO RELATED APPLICATIONS

D1

This application combines the transmitter-receiver disclosures and is a continuation-in-part of commonly-owned U.S. patent applications Serial Nos. 08/857,836 and 08/872,729 filed May 16, 1997 and June 11, 1997, respectively, by the same inventors hereof (now U.S. Pats. 6,026,125 and 5,901,172, respectively). The subject matter of each of said applications is incorporated herein.

This application is also related to commonly-owned U.S. application Serial No. 09/118,919 filed July 20, 1998 (now U.S. Pat. 6,239,741), also incorporated herein.

Sub F17

# CLAIM AMENDMENTS
Serial No. 09/251,297
October 10, 2003

1. (Currently Amended) A range measuring device comprising ~~a waveform adaptive~~ an ultra-wideband transmitter and receiver, said device comprising:

a switched impulse generator to generate a low-level waveform adaptive ultra-wideband signal;

a filter that filters said low-level ultra-wideband signal to define a center frequency thereof and to produce a filtered low-level ultra-wideband signal;

an antenna responsive to said filter to radiate a signal representing said filtered low-level ultra-wideband signal; and

a receiver for receiving said radiated ultra-wideband signal.

D2 cont

2. (Currently Amended) A communication system utilizing an ultra-wideband transmitter, said system comprising:

a switched impulse generator including one of an impulse-excited oscillator and a UWB impulse generator to generate a low-level ultra-wideband signal;

a filter responsive to said impulse generator;

an antenna responsive to said ~~waveform adapter~~ filter to radiate a representation of said ultra-wideband signal; and

a receiver for receiving said radiated ultra-wideband signal.

3. (Currently Amended) A method for detecting an object utilizing ultra-wideband transmitting techniques, said method comprising:

generating a switched impulse, low-level ultra-wideband signal;

filtering said switched impulse, low-level ultra-wideband signal;

after said filtering step, transmitting a signal representing said ~~waveform adapted,~~ switched impulse, low-level ultra-wideband signal; and

receiving from said object a reflected pulse of said ~~waveform adapted,~~ ultra-wideband signal thereby to detect said object.

D2 Cont

4. (Previously Presented) A waveform adaptive ultra-wideband transmitter comprising:

a signal generator to generate a series of discrete low-level ultra-wideband signals having a selectable carrier frequency;

a waveform adapter responsive to said low-level ultra-wideband signals and including at least one of a bandpass filter, a mixer, a pulse shaper, and an attenuator that controls one of frequency, pulse shape, bandwidth, phase, multi-level amplitude, and multi-level attenuation of said low-level ultra-wideband signals, said waveform adapter controlling said low-level ultra-wideband signals on a dynamic, real-time basis; and

an antenna responsive to said waveform adapter to radiate ultra-wideband signals.

5. (Canceled)

6. (Previously Presented) The range measuring device as recited in claim 1, wherein said receiver comprises at least one tunnel diode responsive to an echo pulse.

7. (Currently Amended) The range measuring device as recited in claim 1, further comprising an amplifier that amplifies ~~one of said low level waveform adaptive and~~ said filtered low-level ultra-wideband signals.

8. (Previously Presented) The range measuring device of claim 7, wherein said filter comprises one of a band-pass filter and a pulse shaper.

D2 CONT

9. (Previously Presented) The range measuring device of claim 8, wherein said filter defines a bandwidth of the signal radiated by the antenna.

10. (Previously Presented) The range measuring device of claim 1, wherein the receiver includes:

a variable attenuator coupled to a receiving antenna; and

a detector to detect an output of said variable attenuator.

11. (Previously Presented) The range measuring device of claim 10, wherein said detector comprises a tunnel diode.

12. (Previously Presented) The range measuring device of claim 10, further including a controller that controls the variable attenuator to enable the detector to discriminate between noise and range measuring signals.

13. (Previously Presented) The range measuring device of claim 12, wherein said controller utilizes a bit error rate to discriminate between noise and range measuring signals.

14. (Previously Presented) The communication system as recited in claim 2 wherein said receiver comprises a tunnel diode to detect said radiated ultra-wideband signal~~s~~.

15. (Currently Amended) The communication system as recited in claim 2, further comprising an amplifier interposed between said ~~waveform adapter~~ filter and antenna to amplify said ultra-wideband signal.

D2 Cont

16. (Currently Amended) The communication system as recited in claim 15, wherein said ~~waveform adapter~~ filter comprises one of a band-pass filter and a pulse shaper.

17. (Previously Presented) The communication system as recited in claim 2, wherein the receiver includes:

a variable attenuator coupled to a receiving antenna; and

a detector to detect an output of said variable attenuator.

18. (Previously Presented) The communication system as recited in claim 17, wherein said detector comprises a tunnel diode.

19. (Previously Presented) The communication system as recited in claim 17, further including a controller that controls the variable attenuator to enable the detector to discriminate between noise and information signals.

20. (Previously Presented) The communication system as recited in claim 19, wherein said controller utilizes a bit error rate to discriminate between noise and information signals.

21. (Previously Presented) The method of claim 3, further comprising the step of providing a tunnel diode to receive the reflected pulse.

D2 CONT

22. (Currently Amended) The method of claim 3, further comprising, prior to said transmitting step, amplifying said ~~waveform-adapted~~ switched impulse, low-level ultra-wideband signal.

23. (Currently Amended) The method of claim 22, wherein said ~~waveform adapting~~ filtering comprise one of bandpass filtering and pulse shaping of said switched impulse, low-level ultra-wideband signal.

24. (Previously Presented) The method of claim 23, further comprising the step of defining a bandwidth of the signal radiated upon the object.

25. (Currently Amended) The method of claim 3, further comprising, in the receiving step:

variably attenuating the echo; and

detecting a signal produced by ~~the~~ an echo after said variably attenuating.

26. (Previously Presented) The method of claim 25, further including providing a tunnel diode to detect the reflected pulse.

27. (Previously Presented) The method of claim 25, further including variably attenuating the reflected pulse to enable discrimination between noise and signals representing the echo.

28. (Previously Presented) The method of claim 27, including utilizing bit error rate to discriminate between noise and signals representing the reflected pulse.